

$$\frac{d}{dt} \left( \frac{\partial L}{\partial \dot{x}} \right) = \frac{\partial L}{\partial x}, \quad \frac{d}{dt} \left( \frac{\partial L}{\partial \dot{y}} \right) = \frac{\partial L}{\partial y}$$

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- [c8] 8.The communications processor of claim 1, wherein the DMA agents service processor DMA requests by converting them to messages transmitted onto the at least one ring network.
- [c9] 9.The communications processor of claim 3, wherein if no valid token exists the DMA agent queues the DMA request until a valid token exists.
- [c10] 10.The communications processor of claim 1, wherein the DMA controllers distribute valid tokens by transmitting messages on the ring network that are received by specific DMA agents.
- [c11] 11.The communications processor of claim 1, wherein each DMA controller maintains a list of tokens including those tokens that have been distributed as valid tokens.
- [c12] 12.The communications processor of claim 1, wherein the DMA controllers responds to requests from the DMA agents for additional tokens with an invalid token when no valid tokens are available.
- [c13] 13.The communications processor of claim 1, wherein each DMA controller has a pool of up to 16 tokens for each DMA channel.
- [c14] 14.The communications processor of claim 1, wherein the DMA controllers are capable of reading registers having the pools of tokens for the DMA agents by issuing read messages traveling on the at least one ring network.
- [c15] 15. The communications processor of claim 1, wherein the processors comprise a plurality of network processors and the at least one ring network comprises a plurality of ring networks.